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Brick G Power
Trask Britt
P O Box 2550
Salt Lake City, UT 84110

EXAMINER	
CHU, CHRIS C	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/585,682
Filing Date: June 01, 2000
Appellant(s): KO ET AL.

Brick G. Power
Registration No. 38,581
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on April 1, 2005.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of claimed subject matter

The summary of invention contained in the brief is correct.

(6) Grounds of rejection to be reviewed on appeal

The appellant's statement of the grounds of rejection to be reviewed on apeal in the brief is correct.

(7) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

5286344	Blalock et al.	2-1994
5428240	Lur	6-1995

(9) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Appellant's invention (2000)

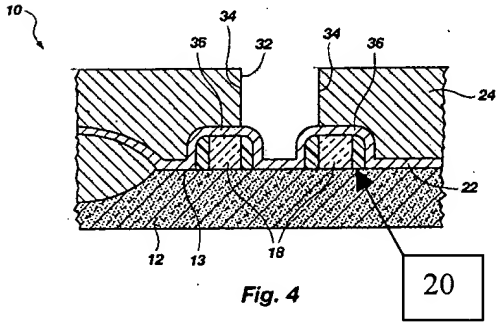

Fig. 4

34: opening

24: passivation layer (doped SiO_2)

22: etch stop layer (Si_3N_4 or undoped SiO_2)

(see page 12, lines 21 – 22)

18: conductive line

20: sidewall spacers

Blalock et al. (1994)

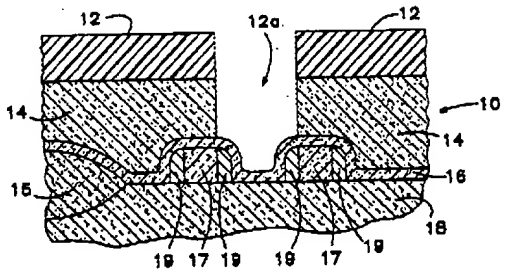

Fig. 2

12a: opening

14: doped SiO_2 layer

16: etch stop layer (Si_3N_4)

17: conductive line

19: sidewall spacers

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 – 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blalock et al. '344 in view of Lur '240.

Regarding claim 1, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 a semiconductor device, comprising:

Claims	Blalock et al.
- a semiconductor substrate including an active surface;	- a semiconductor substrate (18) including an active surface;
- at least one conductive line disposed upon the active surface, the at least one conductive line being flanked by sidewall spacers;	- at least one conductive line (17) disposed upon the active surface, the at least one conductive line being flanked by sidewall spacers (19);
- an undoped SiO_2 cap disposed over and in contact with the at least one conductive line;	- a cap (16 formed of Si_3N_4) disposed over and in contact with the at least one conductive line;

Claims	Blalock et al.
- a passivation layer over the undoped silicon dioxide (SiO_2) cap; and	- a passivation layer (14) over the cap Blalock et al. teaches that the passivation layer may be composed of doped glass (e.g., column 6, line 14); and
- at least one contact aperture defined through the passivation layer and including at least one sidewall extending substantially perpendicularly relative to the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the passivation layer and the undoped SiO_2 cap.	- at least one contact aperture (12a) defined through the passivation layer and including at least one sidewall extending substantially perpendicularly relative to the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the passivation layer and the cap.

Blalock et al. discloses that the cap layer may be composed of silicon nitride, but Blalock et al. does not disclose the material of the cap layer may be undoped silicon dioxide. Lur teaches in e.g., Fig. 3B and column 5, lines 29 – 35 a passivation layer made of doped glass (26) formed over an etch stop cap layer (28). The material of the cap layer (28) may be undoped silicon dioxide as well as silicon nitride. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Blalock et al. by using the undoped

silicon dioxide as the material of the cap layer as taught by Lur. The ordinary artisan would have been motivated to modify Blalock et al. in the manner described above because Lur teaches that undoped silicon dioxide and silicon nitride were known functionally equivalent materials for use as etch-stoppers when etching doped silicon dioxide (e.g., BPSG, column 5, lines 29 – 35).

Claims	Blalock et al.
Regarding claim 2, wherein the at least one conductive line comprises a word line.	As to the language on line 2 of claim 2, "a word line", applicant should note that this is merely function language that does not differentiate the claimed apparatus from Blalock et al.
Regarding claim 3, wherein the passivation layer comprises doped silicon dioxide.	Regarding claim 3, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the passivation layer (14) comprising doped silicon dioxide.
Regarding claim 4, wherein the passivation layer comprises borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.	Regarding claim 4, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the passivation layer comprising borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.

Claims	Blalock et al.
Regarding claim 5, wherein the undoped silicon dioxide cap is at least partially exposed through the at least one contact aperture.	Regarding claim 5, Blalock et al. and Lur disclose the undoped silicon dioxide cap being at least partially exposed through the at least one contact aperture.

Regarding claim 6, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 a semiconductor device, comprising:

Claims	Blalock et al.
- a semiconductor substrate;	- a semiconductor substrate (18);
- at least one undoped SiO_2 structure; and	- at least one insulating structure (16); and
- at least one doped silicon oxide structure over the at least one undoped SiO_2 structure and having at least one sidewall substantially perpendicular to a plane of the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the at least one doped silicon dioxide structure and the at least one undoped SiO_2 structure.	- at least one doped silicon oxide structure (14) over the at least one insulating structure and having at least one sidewall substantially perpendicular to a plane of the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the at least one doped silicon dioxide structure and the at least one insulating structure.

Blalock et al. does not disclose the material of the insulating structure being an undoped silicon dioxide. Lur teaches in e.g., Fig. 3B and column 5, lines 29 – 35 the material of the insulating structure (28) being an undoped silicon dioxide. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Blalock et al. by using the undoped silicon dioxide as the material of the insulating structure as taught by Lur. The ordinary artisan would have been motivated to modify Blalock et al. in the manner described above for at least the purpose of (1) providing an etch-stopping layer for the doped silicon dioxide (BPSG) layer, (2) decreasing in capacitance between the interconnect and other interconnects by using the undoped silicon dioxide instead of silicon nitride, and (3) providing a lower dielectric constant by using the undoped silicon dioxide instead of silicon nitride (Si_3N_4).

Claims	Blalock et al.
Regarding claim 7, wherein the at least one sidewall comprises a sidewall of an aperture.	Regarding claim 7, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one sidewall comprising a sidewall of an aperture (12a).
Regarding claim 8, wherein the at least one sidewall at least partially defines an aperture through the at least one doped silicon oxide structure.	Regarding claim 8, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one sidewall at least partially defines an aperture (12a) through the doped silicon oxide structure (14).

Claims	Blalock et al.
Regarding claim 9, wherein the at least one doped silicon oxide structure comprises borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.	Regarding claim 9, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one doped silicon oxide structure comprising borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.
Regarding claim 10, wherein the at least one undoped silicon oxide structure is at least partially located over a conductive structure.	Regarding claim 10, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure being at least partially located over a conductive structure (17).
Regarding claim 11, wherein the at least one undoped silicon oxide structure comprises an insulative cap over a conductive line.	Regarding claim 11, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure comprising an insulative cap over a conductive line.

Claims	Blalock et al.
Regarding claim 12, wherein the insulative cap is partially exposed through an aperture of the at least one doped silicon oxide structure defined by the at least one sidewall.	Regarding claim 12, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the insulative cap being partially exposed through an aperture of the at least one doped silicon oxide structure defined by the at least one sidewall.
Regarding claim 13, wherein the at least one undoped silicon oxide structure is at least partially exposed adjacent the at least one sidewall.	Regarding claim 13, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure being at least partially exposed adjacent the at least one sidewall.

(10) Response to Argument

I. The Asserted Processing Differences Do Not Undermine the Obviousness Rejection.

Appellant asserts on page 8 that, although the claim is drawn to a structure, processing differences between two references may undermine their combination and thus undermine an obviousness rejection. Although processing differences are typically not a concern when

determining patentability of device claims, if the differences do establish a teaching away, then the rejection must fail. Instantly, appellant asserts that the claimed contact aperture of the invention (and, naturally, that of Blalock) could not be formed by an isotropic etch since such an etch removes material in all directions at the same rate. The implication is that an anisotropic etch must be used to achieve the columnar shape of the aperture. The examiner concedes that such an aperture would be formed by an anisotropic etch. However, as will be shown below, such processing concerns do not undermine the rejection because the structure and the process needed to achieve that structure are taught by Blalock and Lur.

II. The Combination of Blalock and Lur Teaches the Instant Claimed Invention and Motivation Exists for That Combination.

Appellant asserts that the combination of Blalock and Lur must fail as there is no motivation for their combination. Appellant specifically argues that, while Blalock teaches an anisotropic etching of doped silicon dioxide using silicon nitride as an etch stop, Lur does not make obvious the use of undoped silicon dioxide as an etch stop in place of silicon nitride; that Lur does not teach that undoped silicon oxide may effectively be used as an etch stop during *anisotropic* etching of doped silicon dioxide. This is significant because Blalock's etch must be anisotropic. Appellant points to Wolf for the proposition that a wet etch is typically anisotropic while a dry etch is isotropic. However, Lur teaches in column 5, lines 10 – 16 and lines 29 – 32 that the "processing accuracy of the *wet or dry* etching procedure, ... that forms the wedge-shaped BPSG layer 26 [BPSG is doped silicon dioxide] may be improved by forming a thin layer

28" which layer 28 may be silicon nitride or undoped silicon dioxide. (*Emphasis added*). As such, Lur does teach that undoped silicon dioxide is selective to doped silicon dioxide during either a wet or dry etch, hence applicable to either an isotropic or anisotropic etch. Lur also teaches that the undoped silicon dioxide is an etch stop during "conventional dry or wet etching" (column 4, lines 35 – 36, column 5, lines 10 – 18). Clearly, Appellant's argument that processing differences undermine the rejection is not persuasive.

Next, on pages 9 – 10, Appellant also alleges that no motivation to combine Blalock with Lur existed because the Examiner's motivation to combine -to provide an etch-stop layer (undoped SiO_2) for doped SiO_2 layer (i.e., BPSG)- is taken from Appellant's specification. The Examiner understands this argument to be an assertion of improper hindsight. However, this argument is not persuasive because Lur teaches that undoped silicon dioxide and silicon nitride were known, functionally equivalent materials for use as an etch-stopper when etching doped silicon dioxide (e.g., BPSG, column 5, lines 16 – 18 and lines 29 – 32). In view of the fact that the motivation does not include knowledge gleaned only from the Appellant's specification, such a reconstruction is proper. See MPEP 2144.06 citing In re Ruff, 256 F.2d 590, 118 USPQ 340 (CCPA 1958). Thus, Appellant's allegation of improper hindsight motivation is not persuasive.

In all, Appellant's allegation that no motivation exists for the combination of Blalock and Lur is not persuasive.

III. There is a Reasonable Expectation of Success From the Combination of Blalock et al. and Lur.

On page 10, Appellant alleges that there is no reasonable expectation of success to combine Blalock with Lur due to the lack of selectivity for the disclosed etchant between doped and undoped silicon dioxides. It appears that Appellant is alleging inoperativeness solely based on the lack of "etchant" in Blalock and Lur references. However, the invention, as set forth in the claims, is clearly directed to a device. Nowhere do the limitations of the claims define the process in which the instant invention is to be manufactured. Thus, such arguments clearly fail to distinguish the claimed invention from the disclosure of Blalock and Lur. Furthermore, as explained in the above paragraphs, Lur clearly teaches in e.g., column 5, lines 29 – 35 undoped silicon dioxide and silicon nitride were known, functionally equivalent materials for use as an etch-stopper when etching doped silicon dioxide (e.g., BPSG, column 5, lines 16 – 18 and lines 29 – 32). Thus, a combined structure of Blalock et al. and Lur discloses every structural element of the claimed device invention, as explained in the above paragraphs. Therefore, Appellant's allegation of inoperativeness is not persuasive.

For all the reasons provided above, a prima facie case of obviousness of claims 1 – 13 has been established pursuant to the requirements of 35 U.S.C. § 103(a). Therefore, the rejections of claims 1 – 13 are proper and Appellant's arguments for their reversal are not persuasive.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

Appellant's arguments that Blalock et al. and Lur do not established a prima facie case of obviousness against any of claims 1 – 13 are not seem to be reasonable. As explained in the above paragraphs, Blalock et al. discloses every structural limitation except the material of the etch stop layer being an undoped silicon dioxide. Lur teaches in e.g., Fig. 3B and column 5, lines 29 – 35 the material of the etch stop layer (28) being an undoped silicon dioxide. Also, Lur teaches in e.g., column 5, lines 29 – 35 that silicon dioxide and silicon nitride were known, functionally equivalent materials for use as an etch-stop when etching doped silicon dioxide (i.e., BPSG). Thus, Appellant's argument that Blalock et al. and Lur do not established a prima facie case of obviousness against any of claims 1 – 13 is not persuasive.

For the above reasons, it is believed that the rejection should be sustained.

Respectfully submitted,

Tom Thomas

TOM THOMAS
SUPERVISORY PATENT EXAMINER

c.c.
May 31, 2005
Conferees:

Chris C. Chu, Examiner, Art Unit 2815

Tom Thomas, SPE, A.U. 2815

Olik Chaudhuri, SPE, A.U. 2823

Brick G Power
Trask Britt
P O Box 2550
Salt Lake City, UT 84110